

SRNT 3/22/05

10643086 TEMPERATURE SENSING IN AN IN VIVO DEVICE

Type	L or K:	Hits	Search Text	DBs	Time Stamp	Comments
BRS	L1	10319	((dark adj current) or (johnson adj noise) or (shot adj noise) or (thermal adj noise) or (kt adj noise) or (boltzmann adj noise))	USPAT	3/22/05 12:03	see below
IS&R	L2	583	(327/512).CCLS.	US-PGPUB; USPAT	3/22/05 12:01	see below
IS&R	L3	775	(327/513).CCLS.	US-PGPUB; USPAT	3/22/05 12:02	see below
BRS	L5	53	3 and (IMAG\$3 or VIDEO or camera or videosignal or videocamera)	USPAT	3/22/05 12:03	see below, note that this subclass is for temperature COMPENSATION, which is a reason to determine a temperature change.
BRS	L6	6	1 and 2	USPAT	3/22/05 12:03	Browsed, directed toward COMPENSATION for thermal noise, Not using for Temperature measurement
BRS	L7	2	1 and 3 not 2	USPAT	3/22/05 12:11	Browsed, directed toward COMPENSATION for thermal noise, Not using for Temperature measurement
BRS	L4	25	2 and (IMAG\$3 or VIDEO or camera or videosignal or videocamera)	USPAT	3/22/05 12:14	LIST (US 3882384 A) measures Temperature using leakage current of transistor in combination with image sensing.
BRS	L8	44	5 not 2	US-PGPUB; USPAT	3/22/05 12:48	browsed.
BRS	L9	11	("2794863" "3064193" "3157843" "3486821" "3523740").PN. OR ("3882384").URPN.	US-PGPUB; USPAT; USOCR	3/22/05 13:21	Janus Search using US 3882384 A (List; William F.) as kernel

10643086 TEMPERATURE SENSING IN AN IN VIVO DEVICE

Type	L or K:	Hits	Search Text	DBs	Time Stamp	Comments
BRS	L1	7	("5886353" "5929689" "5953060" "6101287" "6330345" "6418241" "4862237").PN.	US-PGPUB; USPAT	3/22/05 14:41	IDS in 10/290,397 - See East Comments
BRS	L2	8	("5008739" "5452001" "20030202111" "6303923" "6607301" "5047863" "6144408" "4739495").PN.	US-PGPUB; USPAT	3/22/05 15:21	892 in 10/290,397- See East Comments

Application Number: **Application Number 10/290,397****Testing 495769 - Form PTO-892, 13-JUN-2004, Paper Number 20050525**

Document Number	Date	Inventor Names	Classification
<u>US-5,008,739</u>	04-1991	D'Luna et al.	348/246
<u>US-5,452,001</u>	09-1995	Hosier et al.	348/230.1
<u>US-2003/0202111</u>	10-2003	Park, Jaejin	348/243
<u>US-6,303,923</u>	10-2001	Wadsworth et al.	250/214LA
<u>US-6,607,301</u>	08-2003	Glukhovsky et al.	374/175
<u>US-5,047,863</u>	09-1991	Pape et al.	348/247
<u>US-6,144,408</u>	11-2000	MacLean, Steven D.	348/241
<u>US-4,739,495</u>	04-1988	Levine, Peter A.	348/247

EAST Search String:

("5008739"|"5452001"|"20030202111"|"6303923"|"6607301"|"5047863"|"6144408"|"4739495").PN.

	Comment
1	integrator or accumulator
2	offset control register
3	CMOS advantage -- sensors can be fabricated on a chip, lower cost ----> dark level is mentioned in Para. 4 ff. -- Para. 8 => temperature variation, ETC.
4	dark level compensation circuit 130 --- dark pixel sensors 114; active pixel sensors 112
5	(Empty)
6	Black pattern correction for charge transfer sensor -- uses a reference dark frame (captured in absence of light)
7	invention here is to use a single dark frame, but use scaling factor for use with different integration times
8	(Empty)
9	(Empty)
10	Col. 4, Lines 24-29 -- dark current levels vary with temperature -- compensation stage 38 uses output of a temperature sensor 40 in thermal contact with imager 12

	Remove	Document ID	Image Document ID	Source	Page#
1	<input type="checkbox"/>	US 20030202111 A1	US 20030202111	US-PG Pub Full	5
2	<input type="checkbox"/>	US 20030202111 A1	US 20030202111	US-PG Pub Full	7
3	<input type="checkbox"/>	US 20030202111 A1	US 20030202111	US-PG Pub Full	8
4	<input type="checkbox"/>	US 20030202111 A1	US 20030202111	US-PG Pub Full	9
5	<input type="checkbox"/>	US 6607301 B1	US 6607301	US Full	1
6	<input type="checkbox"/>	US 6144408 A	US 6144408	US Full	1
7	<input type="checkbox"/>	US 6144408 A	US 6144408	US Full	2
8	<input type="checkbox"/>	US 6144408 A	US 6144408	US Full	7
9	<input type="checkbox"/>	US 5047863 A	US 5047863	US Full	1
10	<input type="checkbox"/>	US 4739495 A	US 4739495	US Full	6

Application Number:

Application Number 10/290,397

Testing 269254 - Form PTO-1449, 21-FEB-2003, Paper Number 022103

Document Number	Date	Inventor Names	Classification
US-5,886,353	03-1999	Spivey et al.	250/370.09
US-5,929,689	07-1999	Wall, Llewellyn E.	327/362
US-5,953,060	09-1999	Dierickx, Bart	348/241
US-6,101,287	08-2000	Corum et al. <i>DARK FRAME sub</i>	382/274
US-6,330,345	12-2001	Russo et al.	382/115
US-6,418,241	07-2002	Schreiner, Horst	382/263
US-4,862,237	08-1989	Morozumi, Shinji	257/72

EAST Search String:

("5886353"|"5929689"|"5953060"|"6101287"|"6330345"|"6418241"|"4862237").PN.

	Comment
1	(Empty)
2	(Empty)
3	CMOS based camera systems have more noise (fixed pattern [caused by dark current/leakage currents]) than CCD-based systems -- Active Pixels have associated amplifier for each pixel.
4	(Empty)
5	MOS image sensor
6	amorphous silicon film has low dark current
7	cancels out dark current with dummy cell array and differential amplifier

	Remove	Document ID	Image Document ID	Source	Page#
1	<input type="checkbox"/>	US 6101287 A	US 6101287	US Full	1
2	<input type="checkbox"/>	US 6101287 A	US 6101287	US Full	7
3	<input type="checkbox"/>	US 5953060 A	US 5953060	US Full	13
4	<input type="checkbox"/>	US 5929689 A	US 5929689	US Full	1
5	<input type="checkbox"/>	US 4862237 A	US 4862237	US Full	12
6	<input type="checkbox"/>	US 4862237 A	US 4862237	US Full	14
7	<input type="checkbox"/>	US 4862237 A	US 4862237	US Full	18

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Remove	Document ID	Image Document ID	Source	Page#	Comment
<input type="checkbox"/>	US 5047863 A	US 5047863	US Full	1	PAPE discloses CID and CCD imagers using dark current correction. Notes dependence on Temperature -- DEFECTIVE Pixel check.
<input type="checkbox"/>	US 4646724 A	US 4646724	US Full	1	Endoscopic photographing apparatus == SATO et al. (U.S. Pat. No. 4,646,724) discloses an endoscopic CCD camera, but does not measure dark current
<input type="checkbox"/>	US 4646724 A	US 4646724	US Full	12	SATO teaches away from sensing dark current or integrating during the dark period (see Col. 7, Lines 51-52).
<input type="checkbox"/>	US 3882384 A	US 3882384	US Full	1	Apparatus for measuring temperature or [and] light intensity -- image array
<input type="checkbox"/>	US 3882384 A	US 3882384	US Full	5	Col. 2 -- Same pixels used for imaging and for temperature measurement by integration of leakage current
<input type="checkbox"/>	US 3882384 A	US 3882384	US Full	6	monolithic array or transistors 27 (Col. 3) and see Col. 4 (temperature dependence of rate of discharge of capacitor)
<input type="checkbox"/>	US 3882384 A	US 3882384	US Full	7	Col. 5 -- mask the sensing element 21 to determine temperature --- Col. 6, Lines 1-17 Compensation --- Lines 50-58: temperature sensing requires one transistor 115 is subject to the temperature to be measured
<input type="checkbox"/>	US 3882384 A	US 3882384	US Full	3	FIGS. 9 through 12 disclose such apparatus for reproducing electrically an optical image by scanning. This apparatus includes the monolithic element 25 having a linear array of transistors 27 disposed thereon.
<input type="checkbox"/>	US 5278656 A	US 5278656	US Full	7	Circuit of CCD 61
<input type="checkbox"/>	US 5278656 A	US 5278656	US Full	13	Col. 3, Problem in prior art -- generating heat by amplifier 23 -- increases dark current -- HYNCECK teaches desirability of inhibiting temperature rise of the solid state imager (Col. 4) == teaches desire to REDUCE dark current for better image quality - NO contemplation of using the dark current for Temp. sensing.
<input type="checkbox"/>	US 5278656 A	US 5278656	US Full	14	endoscope apparatus 41 == imaging apparatus == sitching control == CCD 44 (Fig. 6) or CCD 21 (Fig. 1)
<input type="checkbox"/>	US 5278656 A	US 5278656	US Full	5	CCD imager 44 with details (Fig. 6)
<input type="checkbox"/>	US 5278656 A	US 5278656	US Full	1	Hyncek et al.
<input type="checkbox"/>	US 5278656 A	US 5278656	US Full	6	Figs. 8b, 8c -- reading out image data (communicating with a controller) during periods when the image sensor is not illuminated
<input type="checkbox"/>	US 5278656 A	US 5278656	US Full	2	Fig 1 PRIOR ART
<input type="checkbox"/>	US 5278656 A	US 5278656	US Full	4	Fig 5 has CCD 44
<input type="checkbox"/>	US 20010035902 A1	US 20010035902	US-PG Pub Full	1	Device and system for in vivo imaging
<input type="checkbox"/>	US 20010035902 A1	US 20010035902	US-PG Pub Full	3	Active Pixel circuitry
<input type="checkbox"/>	US 20010035902 A1	US 20010035902	US-PG Pub Full	2	Capsule for in vivo imaging
<input type="checkbox"/>	US 20010035902 A1	US 20010035902	US-PG Pub Full	9	Para 48: CMOS imager -- ultra low power requirements -- dark current response to temperature is LESS than that of solid state devices known in the art --> LOW DARK CURRENT
<input type="checkbox"/>	US 6641529 B2	US 6641529	US Full	1	Endoscope apparatus and method of controlling same ==
<input type="checkbox"/>	US 6641529 B2	US 6641529	US Full	8	A problem, however, is that the dark current varies in dependence upon the temperature of the solid-state electronic image sensing device. An accurate dark-current correction cannot be made because there is a temperature difference between the temperature of the solid-state electronic image sensing device, which is located at the tip of the fiber scope, when it is inside the body of the patient and the temperature thereof when it is outside the body of the patient (the temperature inside the body of the patient is higher).
<input type="checkbox"/>	US 6641529 B2	US 6641529	US Full	10	(Empty)
<input type="checkbox"/>	US 6641529 B2	US 6641529	US Full	11	Since the dark-current correction is applied using dark-current data obtained under conditions in which the internal tissue OB is not being illuminated, the CCD 31 is shielded from light almost completely so that comparatively accurate dark-current data is obtained. Further, since the dark current is measured under conditions in which the CCD 31 is within the body of the patient, the effects of a fluctuation in dark current caused by a change in temperature can be eliminated. This makes it possible to achieve a

	Remove	Document ID	Image Document ID	Source	Page#	Comment
25	<input type="checkbox"/>	US 20040122315 A1	US 20040122315	US-PG Pub Full	1	medical capsule (ingestible -- includes camera, flashlamp, temperature sensor...) US 20040122315 A1 (Krill, Jerry A.)
26	<input type="checkbox"/>	US 20040122315 A1	US 20040122315	US-PG Pub Full	7	an image sensor (Paragraph 26, an autonomous imaging device, an ingestible capsule including an optical camera) and determining a change in temperature in vivo (Paragraph 23, Lines 14-21). The image sensor is contained within an autonomous in vivo device (an ingestible/implantable capsule 10). The device disclosed by Krill further includes a controller, microprocessor 16 (Paragraph 22) for obtaining data samples from the image sensor. No teaching of obtaining a dark current data sample and accepting or receiving a dark current noise of the image sensor
27	<input type="checkbox"/>	US 20040122315 A1	US 20040122315	US-PG Pub Full	8	discloses auxiliary capsules may contain temperature sensors (e.g., in Paragraphs [0023] and [0032]) independent of the imaging camera.
28	<input type="checkbox"/>	US 20040122315 A1	US 20040122315	US-PG Pub Full	6	discloses introducing in vivo (Paragraph 15)
29	<input type="checkbox"/>	US 2768266 A	US 2768266	US Full	1	Thermal Noise thermometer == elements = resistor
30	<input type="checkbox"/>	US 2710899 A	US 2710899	US Full	1	RESISTOR UNIT FOR THERMAL NOISE THERMOMETER
31	<input type="checkbox"/>	US 20040099920 A1	US 20040099920	US-PG Pub Full	5	ROSSI -- also a previously cited publication -- IMAGER circuitry
32	<input type="checkbox"/>	US 20040099920 A1	US 20040099920	US-PG Pub Full	6	Samples dark pixel, calibrates and calculates temperature
33	<input type="checkbox"/>	US 20040099920 A1	US 20040099920	US-PG Pub Full	1	Apparatus for determining temperature of an active pixel imager and correcting temperature induced variations in an imager
34	<input type="checkbox"/>	US 20040099920 A1	US 20040099920	US-PG Pub Full	2	Graph of Dark Current vs. Temperature
35	<input type="checkbox"/>	US 20020175269 A1	US 20020175269	US-PG Pub Full	1	Active Pixel Sensor -- KTC noise, temperature dependent (CMOS)
36	<input type="checkbox"/>	US 6614562 B1	US 6614562	US Full	1	ABSTRACT== Dark current noise may be compensated for in a digital imaging sensor by measuring the temperature of a silicon diode embedded on the same integrated circuit with the image sensor. This information may be used together with initial dark current calibration information, to provide dark current compensation on the fly during image capture. In some embodiments this may avoid the need for multiple shutter operations or repeatedly capturing a dark frame and then capturing a regular image frame.
37	<input type="checkbox"/>	US 6614562 B1	US 6614562	US Full	6	Col. 2 CMOS active pixel sensor
38	<input type="checkbox"/>	US 6614562 B1	US 6614562	US Full	7	Cols. 3-4 == measure temperature using diode 410 as sensor